Conclusion

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The conclusions and recommendations offered below are presented as *broad* and *general* (to be relatively synthetic and brief), *provisional* (based as they are on an initial and still incomplete analytical Atlantic map of the energy and transportation nexus) and *partial* (given that they are framed by the editors—if based on the analysis and conclusions of the authors). Nevertheless, they are suggestive and substantive enough to provide a worthy foundation for future research and policy explorations by the members of the Jean Monnet Network on Atlantic Studies, and by others, whether working within the budding epistemic community of the New Atlantic and pan-Atlanticism or beyond it in the more traditional national, regional or global frameworks.

General Conclusions and Broad Findings

Decarbonization of the transportation sector is an essential, indispensable component of any possible global defense of the 2-degree guardrail, as marked off by the Paris Agreement. This is true in the Northern Atlantic, but it is particularly true in the Southern Atlantic, where it also poses a greater underlying challenge.

Although both transportation energy demand and emissions have significantly slowed in the Northern Atlantic, they are growing rapidly in the Southern Atlantic. Under current projections transportation is poised to overtake the electric power and AFOLU (agriculture, forestry and land-use) sectors to become the largest greenhouse gas (GHG) emitting sector in the coming decades.

Maritime transport demand and emissions are on also the rise across the Atlantic Basin. As with the Southern Atlantic, current and expected future economic growth is one of the principal drivers. However, another important factor in the maritime realm is the relative lack of effective regulation, mainly because it remains beyond the effective and easy reach of land-based, national jurisdictions.

The energy and transportation sectors of the wider Atlantic world are increasingly subject to co-transformation. Put another way, increasingly the two sectors are beginning to change in ways that are mutually dependent on one another, as innovations and developments in energy open new possibilities for transportation infrastructure, and as innovation in transportation creates new horizons for energy. This creates synergies where the pathways of opportunity overlap.

Given the market and technological features of the current energy and transportation nexus in the Atlantic Basin, and in the face of the decarbonization imperative, co-transformation is understood as a self-reinforcing, synergistic process in which renewable energy rollout, battery storage deployment, electric vehicle (EV) penetration, dynamic grid modernization, distributed energy and prosumer participation[1] in the grid, all feed each other in the direction of wider and deeper electrification of the energy and transportation economy. Furthermore, ongoing development of information and communications technology (ICT) applications, together with innovative policy, business, market and regulatory models, could rapidly accelerate the energy and transportation co-transformations.

The energy and transportation co-transformations are most likely to accelerate first in the Northern Atlantic and on land. However, the potential exists for much of the Southern Atlantic to leapfrog over early phases of co-transformation, and for the land-based energy and transportation co-transformations to catalyze change in the maritime realm.

The energy and transportation co-transformations engage each of the strategic approaches of the EASI framework presented in the Introduction: to *enable* energy and transportation policy (e.g., the dynamic grid) to *avoid* future transportation demand and vehicle fleet growth (e.g., integrated urban policy, land-use, energy and transportation planning, along with new platform and sharing models for urban transportation), to *shift* such demand to higher occupancy transport modes (e.g., public transportation and mass mobility), and to *improve* the quality of the vehicle fleets in terms of fuel economy and emissions (e.g., vehicle fuel efficiency and emissions standards, and alternative vehicles and fuels).

1. A "prosumer" is defined by the U.S. Department of Energy, as someone who both produces and consumes energy—a shift made possible, in part, due to the rise of new connected technologies and the steady increase of more renewable power like solar and wind onto our electric grid. https://energy.gov/eere/articles/consumer-vs-prosumer-whats-difference.

If the co-transformations accelerate, the energy-transportation nexus of the Atlantic will begin to move toward: (1) progressive electrification of land-based passenger transportation; (2) a passenger modal shift from private light-duty vehicles to public transportation and mass transit, particularly in urban areas; (3) a fuel switch to liquified natural gas (LNG) for freight and cargo transportation on both land (in heavy-duty road vehicles) and at sea (in tanker and container vessels); and, over the longer run, (4) the partial electrification of land freight transport (through modal shift from road to rail); along with (5) partial electrification of maritime transportation (in smaller vessels and in ports at shoreside).

The factors and trends shaping the energy and transportation nexus and driving its co-transformation are diverse, but the most influential include:

1. the global policy imperatives to: (a) reduce GHG and air pollutant emissions; and (b) eliminate energy poverty and foster sustainable development and growth, particularly in the Southern Atlantic;
2. continued globalizing economic growth, deepening global value chains (GVCs), and ongoing expansion of maritime trade and transport;
3. the ongoing technological advances in renewable energy, battery storage, and electric vehicles, and the resulting and continuing drop in costs in all three interrelated markets;
4. the emerging potentials for dynamic grid modernization and transformation;
5. the catalytic impact on the energy-transportation nexus of a series of other potentially interlocking co-transformations in the ICT and related sectors, including manufacturing and trade, maritime affairs and regional governance.

The Land-Based Nexus of Energy and Transportation in the Wider Atlantic

The decarbonizing potentials for co-transformation of *land-based* energy and transportation are strongest, in the short to middle run, in the transportation markets that are the most mature, the most easily electrifiable, and where ICT and energy model innovations can rapidly transform grids that are dense and complex.

As such, the potentials for more rapid and deeper co-transformation—at least in the short and middle run—are more visible and immediate in the Northern Atlantic than in the Southern. In Europe and North America, nascent electrification of transportation, increasingly powered by renewable energy (both central grid-based and distributed), is already underway and gathering momentum, and it is currently poised for major infrastructural expansion. The total cost of ownership (TCO) of alternative-fuel vehicles is projected to equalize with those of conventional vehicles around 2025 (based on a recent study of the Basque country in Spain)—and this date is likely to be brought forward, if recent experience with renewable energy and battery cost reductions is any indication. The major unknown, influenced by future technological development, policy and political economy, is how intense this co-transformation will ultimately be, and how rapid (or slow) and how far-reaching (or limited) the resulting electrification of transportation.

In Africa and Latin America and the Caribbean (LAC)—where such electrifying co-transformation might appear farther off along the development horizon—there are, however, some other approaches with significant potential to stimulate the initial phases of the decarbonization of transportation in the short to middle run, and to lay the foundation for deeper electrification over the longer run. These include, for example, transport modal shifts and smart motorization management policies. In addition, by facilitating the modernizing process of dynamic grid transformation, ICT developments increasingly allow less mature markets in the Southern Atlantic to leapfrog over stages and configurations already passed through by the mature markets. As a result, it might be possible for LAC and Africa to engage the electrifying energy and transportation co-transformations more rapidly than would otherwise be the case. However, the pattern of electrification is likely be very different (and more distributed than in the Northern Atlantic), given that the central-grid-utility model of electric energy has limited reach in the Southern Atlantic, and given that energy poverty invites and favors off grid and micro-grid development.

The Northern Atlantic

The Northern Atlantic transportation sectors are mature, the average fleet is fairly young, and the private vehicle markets, under their current fossil fuel configurations, are relatively saturated. Broad anti-emissions efforts, underway for some time, have improved vehicle and fuel efficiency and quality, while fuel demand has levelled off and projected business as usual demand for transportation is also relatively flat. Because the opportunities for avoiding future increases in GHG-producing transportation demand have largely passed, the most pressing need is to improve the large vehicle fleet, from an economic and environmental standpoint. Therefore, vehicle and fuel standards, along with policy facilitation or promotion of alternative vehicles and fuels (and their accompanying infrastructures and market and regulatory models) remain at the forefront of academic research, policy debates and private sector innovation.

Nevertheless, some opportunities for emissions-cutting transportation modal shifts in the Northern Atlantic could also still be taken advantage of—for example, at least a partial modal shift of land-based freight transport from road to rail. This potential exists because LNG—increasingly considered the lower carbon bridge fuel substitute for diesel in truck freight transport—is still a fossil fuel. Natural gas emits about 75 percent of the CO_2 emissions of diesel, per million British thermal units (Btu) of energy. On the other hand, rail transport can be electrified more easily than heavy-duty road trucks (and more or less completely decarbonized if renewable energies eventually dominate the generation mix).

The Southern Atlantic

In the Southern Atlantic, the highest transportation policy imperative would be, at least in theory, to avoid future transportation emissions by eliminating future passenger transport demand, along with the attendant rise in the motorization rates and in passenger VKT (vehicle-kilometers-traveled). However, the most efficient way to do this—by developing dense, compact, multifunctional and economically aggregating cities which structurally eliminate the demand for motorization by providing for the possibilities of cycling, walking and more use of efficient two-wheel vehicles, in addition to public transport and mass transit—is less viable in the Southern Atlantic (particularly in Africa, if to a lesser extent in LAC).

The many imperfections in local land, property and other markets, together with a relative lack of effective urban policy planning, land-use management and adequate regulation, have led African cities, in particular, to sprawl in ways which reduce density. Nevertheless, with ongoing improvements in municipal, land-use and regulatory governance across an increasingly large and still growing cohort of large cities in the Southern Atlantic—whose continents have the highest and fastest urbanization rates in the world as well as the world's fastest growing cities—the potential for municipal and urban policy to avoid transport demand and emissions will increase—particularly if Atlantic Basin cities cooperate in these areas.

In the short to middle run, however, much of the potential to reduce transportation emissions in the Southern Atlantic is found in the possibility of provoking modal shifts from higher to lower-emitting transportation modes (or by improving or refining currently ongoing modal shifts, as in the continued development of public transportation and mass mobility programs in LAC). This would involve shifting passenger and freight traffic—both existing and that projected in the future—from (higher-emitting) road to (lower-emitting) rail, in general; and from (low-occupancy) private passenger vehicles to different forms of (higher-occupancy) public transportation and mass transit, both road- (BRT, or bus rapid transit) and rail-based (metro and light rail), in particular. Such public transportation-related modal shifts could be supported as well, particularly in LAC, by low carbon generated electrification of high use/high occupancy vehicles. Nevertheless, some modal shift options in the Southern Atlantic face entrenched barriers, including many of the same obstacles that complicate an avoid approach to transportation decarbonization.

It would seem obviously useful as well to attempt to improve the efficiency and emissions quality of vehicles and fuels in the Southern Atlantic, and to reduce the age profile of the fleet and related infrastructure. But this approach is partially undermined by the existence of international market and regulatory failures which are abetted by policy planning, regulatory and governance weaknesses in the Southern Atlantic. The combination of these failures and weaknesses leads to a form of emissions dumping or leakage.

Operating in both halves of the wider Atlantic, these market and regulatory failures combine to generate carbon externalities which are exported from the Northern Atlantic (and industrialized Asia) and dumped or leaked into the Southern Atlantic (and particularly into Africa) in the form of older, less-efficient, dirtier, higher-emitting secondhand vehicles. A global supply of such vehicles is continually created as increasingly stringent vehicle and fuel efficiency and emissions standards in the Northern Atlantic provoke their retirement from advanced economy fleets. Globally, at least 15 million—but as many as 35 million—light duty vehicles are estimated to be traded internationally as secondhand vehicles every year. They are easily (and principally) imported into LAC and Africa, where regulation and governance are relatively weak, tax income is still partly dependent on import tariffs, and a burgeoning, aspiring, would-be urban middle class provides strong structural upward demand for relatively cheap secondhand vehicles—along with a short term political motive to facilitate them.

However, another policy distortion relatively widespread in the Southern Atlantic provides yet additional support for secondhand vehicle demand: transportation fuel subsidies—which in LAC alone account for a quarter of the global total—push down the per kilometer cost of driving, increasing demand for private over public transport and slowing even further the development of alternative vehicles markets in the Southern Atlantic. As a result, by 2030 it is estimated that the secondhand vehicle trade will equal new car sales in the EU and China combined, unless new policy or cooperation intervenes.

Some Southern Atlantic countries prohibit secondhand imports, but many do not. In the absence of secondhand vehicle trade restrictions, this set of circumstances undermines the obvious improve approach open to the Southern Atlantic—that is, to establish and enforce progressively more stringent vehicle and fuel efficiency and emissions standards. Any such standards—which currently are largely and conspicuously absent from both continents—would be broadly circumvented by the steady flow of secondhand imports—which increasingly dominate private vehicle fleets (both light- and heavy-duty) in the Southern Atlantic (and particularly in Africa)—at least while they remain insufficiently regulated at the national, regional and international/transnational levels.

Grid Modernization as a Catalyst of Co-transformation at the Nexus of Energy and Transportation

Actions to *enhance the quality of the electricity grid* through modernization and dynamic transformation could constitute an essential contribution to the decarbonization of transportation in both the Northern and the Southern Atlantic. The dynamic grid and the distributed energy services model technologically *enable*, even catalyze, other avoid, shift and improve policies and actions impacting on the energy-transportation nexus and its co-transformation—much like the quality of governance and regulation institutionally enable these other policy approaches within the EASI framework.

The interlocking intersection—precisely at the energy-transportation nexus—of all the previously mentioned co-transformations (incorporating energy, transportation, ICT, manufacturing and trade) increasingly facilitates grid modernization and transformation. These overlapping co-transformations structurally favor the emergence of a dynamic grid in which central-station-based utilities, involved in generation and distribution under centralized grid management, increasingly co-exist with distributed energy and microgrids, interactive grid and demand side management, prosumer participation in energy generation and in provision of ancillary grid services, including significantly increased storage capacity as a result of the growing aggregate of plugged-in appliances (e.g., home batteries, hot water heaters and electric vehicles, among others). A dynamic grid transformation would reinforce the economic and scale logics of the electrification of both passenger and freight transportation, which in turn would feed further decarbonizing modal shifts from road to rail.

New organizational (market, business and regulatory) models, including sharing platforms, energy services companies (ESCOs), and energy (and related) cooperatives, could help stimulate a leapfrogging of the fossil-fuel-based central-grid model by contributing to the modernization and transformation of the dynamic grid in the Southern Atlantic, particularly in Africa. Dynamic grid transformation, in turn, would further stimulate renewable energy generation, EV penetration, and the electrification of transportation and the broader economy.

The Maritime Energy-Transportation Nexus in the Wider Atlantic

While the emergence of the dynamic grid has the potential to intensify the land-based energy and transportation co-transformations and to provide opportunities for technological leapfrogging, the maritime realm continues to represent a potential sink for the leakage of carbon and air pollutant externalities into the sea.

Deepening globalization—driven by containerization, declining shipping costs and proliferating global value chains (GVCs)—has created and absorbed significant new trade and transportation demand. But the transport sector has been allowed to externalize within the maritime realm the cost of ever greater shipping emissions (GHGs but also air pollutants). Maritime emissions are poised to continue growing over the next two decades and are projected to expand to over 5 percent of all GHG emissions (from under 4 percent as of recently). This is happening even as land-based transport emissions are beginning to slow under the regulatory effects of the global climate efforts represented in the Paris Agreement. This is in part because maritime emissions remain beyond the United Nations Framework Convention on Climate Change (UNFCCC) framework and are negotiated instead within the International Maritime Organization (IMO). The growing lure of the emerging blue economy[2] will only intensify the maritime leakage of these emissions externalities—unless action is taken to strengthen maritime governance, in general, and emissions control, in particular, across the Atlantic Basin.

2. Broadly defined, "blue economy" means ocean or marine economy; more tightly defined it has come to mean sustainable ocean economy, analogous to green economy within the land-based, continental contexts. For a discussion on the various competing definitions of the blue economy, see "What a blue economy really is—WWF's perspective," July 10, 2015 http://wwf.panda.org/homepage.cfm?249111/What-a-blue-economy-really-is.

Maritime transportation is a key element in the Atlantic (and global) emissions profile; but its true significance remains obscured if it is not considered in integral fashion within the more encompassing context of multi-model transportation networks which incorporate both terrestrial and maritime transportation infrastructures and flow routes (along with links to complementary and growing air transport).

Multi-modal transportation has been part and parcel of both the post-War and post-Wall phases of globalization. But during the most recent phase of the post-Wall period, characterized by the constantly shifting fragmentation patterns of global production and the intensifying development of global value chains, the notion of multi-modal transportation has been a particularly salient aspect of the energy-transportation nexus. Deepening global integration and intensifying global value chains not only stimulate increased trade volumes, but they also provoke ongoing shifts in trade routes and patterns. This in turn results in an expansion of multi-modal transportation journeys which incorporate both land-based and maritime transportation.

As the inter-modal interfaces of the global energy-transportation nexus, port-cities have an increasingly important role to play in this energy and transportation co-transformation. While maritime transport can facilitate, even catalyze, the blue economy, port-cities can bind, energize and direct it. Port-cities are the natural, if still potential, economic, technological and governance gateways and platforms for the co-transformations of the land-based energy-transportation nexus, empowered by dynamic grid transformation across the continental landmasses, to reach into and integrate with the maritime realm.

As the fulcrum of maritime and trade operations, hinterland transportation, and regulatory governance of overlapping land and maritime jurisdictions and policy areas, port-cities can strategically enable the related land-based co-transformations to catalyze their counterparts in the maritime realm. With the ongoing development of the nascent blue economy in the Atlantic, the energy, transportation and ICT co-transformations in the maritime realm are also poised to intensify, if port-cities can renovate their strategic operation and policy interfaces.

Recommendations

Recommendations for Energy and Transportation Policy

A number of broad policy recommendations for particular continents and transport modes are made by the authors. These include:

For Latin America and the Caribbean:

- More (and increasingly stringent) vehicle and fuel standards.
- More active motorization and fleet management policies (including feebates and vehicle registration tax emissions adjustments).
- Progressive elimination of transportation fuel subsidies.
- A broadening and deepening of modal shift to public transportation, urban mass transit and mobility.
- Electrification of high use/high occupancy vehicles such as taxis, buses, metros, light rail.
- A partial mode shift for freight from road to rail.

For Africa:

- Informal (paratransit) bus sector reform
- Policies to improve last-mile connectivity (supported by ICT and sharing platforms)
- Motorization and fleet management policy (including feebates for retiring secondhand vehicles)
- Freight logistics consolidation and partial freight modal shift to rail

For the North Atlantic:

- Establishment of specific targets for electric vehicle penetration
- Provision of more EV incentives and supports
- Grid modernization and dynamic grid transformation
- Incorporation of maritime emissions into the ETS and other emerging regional emissions markets

Recommendations for Pan-Atlantic Cooperation

The following are recommended areas and modes of pan-Atlantic cooperation in energy and transportation:

Pan-Atlantic Cooperation on Maritime Emissions Reduction

This could involve transnational cooperation (see below) between Atlantic coastal countries, regional economic communities, port-cities and the private sector, and the creation of an *Atlantic Forum on Maritime Emissions*. Specific agenda items could include the extension of IMO Emissions Control Areas to the broader Atlantic, and the inclusion of maritime emissions in the EU's ETS. Such cooperation would enhance the approach to improving the maritime transportation fleet in terms of vessel and fuels, efficiency and emissions of both GHG and air pollutants. It would also help close the carbon externality leakage from land to maritime jurisdictions, as a result of, among other factors, the development of global value chains—which have contributed to a reduction in maritime transport costs but also to a highly elastic response in terms of maritime transport demand and traffic volumes which have more than compensated for the high levels of carbon efficiency achieved by maritime shipping.

Pan-Atlantic Cooperation for the Greening of Maritime Energy, Transportation, and Climate Infrastructure

Compatible with the pan-Atlantic cooperation on maritime emissions just proposed (either in parallel with or as an integral part thereof), this could involve specific cooperation among Atlantic cities, but particularly port-cities, and the establishment of an *Atlantic Port Cities Forum*. The agenda could include data sharing and coordinated strategy planning, and policy and best practice development and exchange. The multiple synergies generated by effective city/port-city modernization and transformation would strengthen the enable approach to transportation decarbonization—grounded upon quality institutions, effective policy and land-use planning, and smart regulation and governance. This would in turn also support shift and improve approaches, both in the terrestrial and maritime transportation realms.

In shipping and other maritime vessels, such collaboration would facilitate both the fuel switch to LNG and the increasing provision of green energy in ports —produced both onshore and offshore, through the central-grid and from distributed sources—to ships at shore and during their approaches to and departures from port. Pan-Atlantic cooperation among Atlantic cities could also stimulate appropriate modal shifts for the land-based transport between port terminals and hinterland production sources and/or consumption destinations.

Pan-Atlantic Cooperation for Effective International Regulation of Secondhand Vehicles Trade

This could involve cooperation among Atlantic Basin regulators, regional economic communities and relevant private sector associations—in an *Atlantic Forum on Motorization Policy and Fleet Management*—to seek efficient and effective collaborative methods for reducing secondhand vehicle trade and promoting smart motorization management. The agenda could be structured upon a *quid pro quo* of regulatory commitments on behalf of both exporters and importers—possibly recycling of retired vehicles in the Northern Atlantic and fiscally-neutral feebates (pioneered in France and Chile) in the Southern Atlantic to encourage and support the displacement of secondhand imports by newer, more efficient and lower-emitting vehicles.

Such pan-Atlantic transnational cooperation could improve regional/international policy planning, regulation and governance which in turn would increasingly enable emissions-cutting improvements in the vehicle fleets by overcoming international market and regulatory failures which continue to delay the decarbonization of passenger (and freight) transportation in the Southern Atlantic. This would help to stem the other carbon externality leakage of retired higher-emitting vehicles imported from the Northern Atlantic (and Asian) economies into the exploding Southern Atlantic transportation markets.

Pan-Atlantic Cooperation on Grid Modernization and Transformation

This could involve pan-Atlantic cooperation among a transnational range of grid-relevant actors and grid-interested stakeholders in an *Atlantic Forum on the Dynamic Grid*. The agenda might embrace the evolving role of utilities, new generation, distribution and business models, and best practices for dynamic grid transformation.

There is enormous multiplying and amplifying potential of the dynamic grid in both the Northern and Southern Atlantic, even if such potential would follow geographically specific patterns in the different continents. Therefore, there is long term value to pan-Atlantic collaboration that tests and accelerates a new energy and transportation future, and the co-transformation at their nexus, focused on local control and grid-optimization, enabling and enabled by electrification.

As part of this pan-Atlantic grid cooperation, or independent of it, pan-Atlantic cooperation could also take place directly among energy cooperatives and cooperative associations in North America, Europe, Africa and Latin America: An *Atlantic Energy Cooperatives Forum*. Energy cooperatives already cooperate trans-Atlantically and globally; their operating methods, goals and objectives, and areas of action and potential overlay neatly with the possibilities of a more distributed and dynamic grid. Pan-Atlantic cooperation among energy cooperatives could facilitate dynamic grid transformation by serving as a most effective conduit and catalyst for Latin American and African leapfrogging of much of the Northern Atlantic's energy and transportation development phase, defined by the central-utility-grid model in energy and fossil fuels in transportation.

Implications for the European Union and Other Atlantic Actors

The implications for Europe, of both the conclusions and the recommendations, are large. The ongoing story of the Atlantic energy renaissance and the recent intersection of the energy, transportation and ICT co-transformations call out for EU pan-Atlantic initiative, if not outright leadership. Many characteristics which Europe (in general and the EU in particular) has acquired over time now overlap in a synergistic way such as to recommend a concerted effort to exercise leadership in the creation of a tangible, useful pan-Atlantic transnational space in energy, transportation, and broad maritime affairs.

Europe is not only one of the original sources of the pan-Atlantic idea; it is also one of the world's regional leaders—if not the leader—in the nascent energy, transportation and related co-transformations already underway. Europe is also the global regional leader in the interdisciplinary integration of strategic and policy planning and execution, in the crafting of related domestic and international EU strategies and policies in ways that are consistent with—and reinforcing of—each other's objectives and dynamics. In the international governance realm, the EU has also long been a pioneer of transnational cooperation. This is evident in the EU's approach to climate change and maritime governance.

Not only is Europe experienced and innovative enough to take the catalytic lead in the construction of pan-Atlantic, transnational cooperation, it is also big enough to have an effect. The specific weight and gravity of the EU and broader Europe within the energy, transportation, climate and trade sectors of the Atlantic Basin is large enough to overcome, and perhaps even to fill, the relative vacuum created by the retreat of the U.S. from the global climate regime embodied in the Paris Agreement and from the most recent cyclical cresting of the quest for effective global governance.

Europe has the international credibility and weight to catalyze cooperation across the Atlantic Basin. The EU's regional integration, its integrated strategic policy planning capacities, and its strategic global posture with respect to governance (with its transnational map of relevant actors), all serve at least as inspirational models in the Southern Atlantic. However, Europe's leadership role in the pan-Atlantic space should focus primarily on providing initiative to such pan-Atlantic cooperation projects and initial support to galvanize their activities—as opposed to directly managing the agenda or imposing EU models upon the Atlantic.

This is because both the challenges and the opportunities of the energy and transportation co-transformations in the pan-Atlantic context exhibit strong transnational features: (a) they have a regional, international or global reach (and are therefore beyond the capacity of any single country to decisively influence) and (b) they involve and affect a broad cross-section of actor and stakeholder agents. Therefore, the EU will need a range of different kinds of Atlantic partners in this endeavor, each contributing their own unique capacities.

Transnational cooperation is not just multinational, whether regional, transregional or interregional; it is also, crucially, multi-actor and multi-agent. It is based on, and comprised of, not just formal national representations or relations between states (and sometimes not even), but also other geographical and spatial levels of governance—both from scales larger than the state (i.e., regional organizations and regional economic communities, or RECs, to which nation-states belong), and from smaller scales (i.e., sub-state regions and cities)—along with non-state actors, including civil society groupings, academic and strategic studies communities, non-governmental organizations and the private sector.

This means that, in addition to the EU, the Atlantic Basin's other regional economic communities (or RECs) also have an important strategic role to play in pan-Atlantic transnational cooperation on energy, transportation and the related maritime realm. Among other capacities, RECs are essential cooperative agents for the integration, coordination and tracking of strategies.

Atlantic Basin cities—both in the Northern and Southern Atlantic—and particularly the Atlantic port-cities, also have a special and transformative role to play in any pan-Atlantic energy and transportation future. Atlantic port-cities should become the central nodes in a pan-Atlantic network of multiple types of transnational actors collaborating and cooperating on a series of overlapping pan-Atlantic maritime issues linked to energy-transportation nexus.

The private sector is a key source of information, finance and infrastructure, and an underlying driver of the energy, transportation and blue economy activity that gives rise to the need for pan-Atlantic transnational cooperation. Civil society groups, including NGOs, are also key actors in transnational cooperation, in their role as essential stakeholders for providing balance and input to the private sector. In a similar way, academic and strategic studies provide a third-party-assessed analytical support to the public sectors of multi-level-state governance.

A series of transnational Atlantic Basin cooperation platforms—the *Pan-Atlantic Forums*—could embrace energy, transportation, maritime and related realms, and could be supported and engaged by Atlantic governments, Atlantic regional economic communities (including the EU, in a key leadership and catalytic role), Atlantic port-cities, cities and regional-subnational governments, the relevant and interested Atlantic private sector, along with Atlantic civil society organizations and strategic studies centers.

The proposed *Pan-Atlantic Forums* could be developed under the auspices of the Jean Monnet Network on Atlantic Studies (directed by the Fundação Getulio Vargas), the Atlantic Basin Initiative (of the Center for Transatlantic Relations at Johns Hopkins University SAIS), the Atlantic Dialogues (of the OCP Foundation and OCP Policy Center), the Wider Atlantic Program (of the German Marshall Fund of the U.S.), or the legacy network of the EU's FP7 Atlantic Future project (formerly directed, and still stewarded, by CIDOB)—or under any combination of partnership or consortium involving of any or all of the above institutions.

Limitations, Gaps and Future Research

Admittedly, this book has limitations—many of them imposed by the typical constraints of resources and time which almost inevitably force the editor to triage certain potential areas of coverage. As a result, there are some gaps in the initial, analytical Atlantic map of energy and transportation surveyed by this book. We explicitly identify some of them here, providing some attempt at justification, along with some additional comment on their potential significance and place within an ongoing agenda for future research and treatment.

The nearly complete absence of *air transportation* from the book's discussion clearly constitutes a gap. The reason is found in the justification given by Viscidi and O'Connor in Chapter Four when explaining their focus on passenger and urban public transportation in LAC, and their exclusion of maritime and air transport from their analysis: priority of coverage was given to the modes with the largest current and future projected market and emissions shares. Beyond land-based transportation, the book gave priority of coverage to maritime transport. Nevertheless, air transport remains an important element to eventually incorporate, particularly as ICT and the cybereconomy enable the freighting of small, light consumer goods by air.

Biofuels, the first major substitute for oil in transportation, are also only lightly touched upon. Although biofuels are key in Brazil, and could contribute eventually to some of the fuel mix in parts of Africa, they remain in partial competition with electrification, and as liquid fuels they are at least partially dependent on the fate of the traditional fossil-liquids based transportation system. While it is difficult to see Brazil reversing its path on biofuels and bioenergy, the fact that LAC's largest country will likely remain with a mixed transportation system—based on some balance between the traditional liquids-based transportation infrastructure (if increasingly supplied with biofuels as opposed to gasoline and diesel) and electrified transport (perhaps concentrated in urban public transportation, mass transit and mobility)—means that land-use competition could intensify, as biofuel production places greater agricultural land-use demand upon Brazil's tropically-sensitive AFOLU sectors. This, in turn, will increase the premium not just on land-use planning, forest protection and restoration of degraded lands, but also on the *strategic coordination and integration of energy, transportation agricultural, land-use and forestry policies*. A continued strategic bet by Brazil on biofuels would require it to more effectively integrate the energy and land components of climate strategy. The potentials and limits of such strategic coordination of climate policy, particularly in Brazil, remains as an important future research agenda item.

The United States—usually an obligatory, and privileged, vantage point in any transatlantic or pan-Atlantic discussions and framings, if not the leading focus—has also not be treated independently or at length. However, developments in the U.S., and their evolving contexts, are touched upon in a comparative way by at least half of the authors. Furthermore, there is also a widespread and intensifying Atlantic perception of U.S. retreat from climate (and even global) leadership, and at least a temporary return to a nationalist, fossil fuel privileged energy policy. This perception, in turn, has fostered a sense of prudence among those accustomed to headlining U.S. reality and perspectives precisely because of that long-established leadership role, given that this retreat and reversal were relatively unexpected and very large in their potential consequences, like Black Swans. Furthermore, the recent U.S. retreat from the Paris Agreement, in addition to its continued absence from the UN Law of the Sea Treaty, is one of the underlying motivations for this book's recommendation that Europe take the initiative on pan-Atlantic cooperation in energy, transportation and maritime affairs, collaborating with the full range of US actors, but placing the priority of stimulating transnational cooperation which embraces the Southern Atlantic.

The future potential of *ocean energy*, including offshore wind, has also not been incorporated; however, this too remains a research agenda item for the future. Important research and analysis also remains to be undertaken on the impacts of energy and transportation decarbonization on the *future patterns of maritime trade (particularly international energy trade)* and on shipping and port infrastructure, as well as on *the future evolution of what we know as the geopolitics of energy,* and the *wider implications for geopolitics* in general. While such themes are very relevant to energy and transportation, they are also integral to a discussion of Atlantic trade and security, the next items on the Jean Monnet Network research project agenda, and can therefore be undertaken and incorporated with time.